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Construction Bulletin

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CEMP-C

Subject: Use of Construction Products in Metric Projects

Applicability: GUIDANCE

1. REFERENCES.

a. Federal Register, Vol. 61 No. 96, 16 May 1996, 24761 - Federal Agency Guidance for the Acquisition of Modular Metric Construction Products.

b. Public Law 104-289, Savings in Construction Act of 1996 (110 Stat. 3411) - Sec. 14, which specifically applies to two modular products - concrete masonry units (CMU) and recessed light fixtures.

2. PURPOSE.

This Construction Bulletin (CB) provides information on USACE progress and guidelines for using modular metric (hard metric) construction products in metric projects.

3. BACKGROUND.

a. In 1988, Federal law mandated the metric system as the preferred system of measurement in the United States (US) and required that metric be used in all Federal procurement, grants, and business-related activities, to the extent feasible, by 30 September 1992. The law is intended to pursue metrication for increased cost-effectiveness and productivity of US business and to provide greater access to markets while avoiding any undue burden on US firms. Executive order 12770, *Metric Usage in Federal Government Programs*, dated 25 July 1991, required Federal agencies to develop specific timetables and milestones for transition to the metric system.

b. USACE has made substantial progress in the adoption of metric measurements. All Corps of Engineers Guide Specifications (CEGS) and all active Department of the Army (DA) standard design packages (11 designs) for military projects have already been converted to the metric system. Current USACE metrication policy is to design all FY 97 and future military and civil works projects using the metric system of measurement. While recommended, USACE policy regarding metrication is not mandatory for small

O&MA projects, projects with Non-Federal sponsors or projects that use non-metric as-built drawings extensively where the use of the metric system may not be economically feasible. Currently we have 270 (civil and military) metric projects ---totaling approximately $1.9 billion under planning, design or construction.

c. The metrication process for products involves "soft metric conversion" and "hard metric conversion." Dimensions for the vast majority of construction products need only be "soft-converted" for use in metric construction projects. A soft metric conversion means that the physical dimensions of the product remain unchanged while the measurement units used to describe and specify the product are changed to metric units. To make metric construction succeed, a small percentage of products need their physical dimensions "hard-converted" to fit them into the internationally recognized building module of 100 millimeters (mm). These products are frequently referred to as modular products or hard metric products. Modular construction products are brick; CMU (also known as concrete block); components of the suspended ceiling systems such as acoustical ceiling tiles, recessed lighting fixtures and air diffusers; raised access flooring; wallboard; plywood; particleboard; and rigid insulation. According to the guidelines in reference 1a., a modular construction product in a hard metric size shall only be specified in a Federal construction project if the product's application requires it to "dimensionally coordinate" into the 100 mm building module, the product is found to be competitively available, and the product's total installed cost is reasonable. Total installed cost is the cost of purchasing and installing the product including all cutting/trimming necessary to fit them with other building components in a 100 mm building module. Use of modular products avoids unnecessary jobsite cutting or trimming fostering cost-effective, logical design and quality construction.

4. GUIDELINES FOR SPECIFIC MODULAR CONSTRUCTION PRODUCTS.

a. Steel Reinforcing Bar. The actual diameter size of steel reinforcing bar is not required to change in order to coordinate dimensionally into the 100 mm building module. Therefore, the American Society for Testing and Materials (ASTM) has recently adopted new metric bar standards which are based on soft conversion of existing inch-pound bars.

b. Brick. Many common brick sizes are within a millimeter or two of metric modular sizes and nearly all can fit within 100 mm module by slightly varying mortar joint widths to 10 mm.

c. Concrete Masonry Units (CMU) . The new legislation which becomes effective 10 January 1997 (reference 1b) allows Federal agencies to specify only hard metric versions of CMU unless (1) the block will be required to fit together into the 100 mm building module, and (2) the "agency head" determined (prior to contract award) that the total installed price of hard-metric CMU is estimated to be equal to or less than the total installed price of using inch-pound (soft metric) CMU. To comply with the new law, the majority of the Federal agencies including USACE, elected to let the construction contractor use either metric or substitute inch-pound blocks in metric projects without

compromising design requirements. Construction documents for bids or proposals, issued after 10 January 1997, will incorporate this policy. It is the general contractor, not the government, who will make the decision whether metric or inch-pound concrete block offers the most efficient and cost-effective solution in each situation. If the general contractor decides to use inch-pound CMU, the following provisions should be met so that quality is not jeopardized: (1) mortar joint width should be no less than 10 mm; (2) horizontal reinforcements, if required, should be placed between the joints only; (3) no cut block should be put at the end of a wall; and (4) if the vertical reinforcement and the masonry block webs do not match, the block must be cut to adjust. Rebars will not be cut, bent or eliminated to correct this condition.

d. Suspended Ceiling Systems. Components for suspended ceiling systems are T-bars, hangers, ceiling tile, recessed lighting fixtures, and recessed air diffusers. All components are available in modular metric sizes and are priced competitively with their inch-pound counterparts with the exception of recessed lighting fixtures. In this case also, for compliance with the above mentioned law, USACE and other Federal agencies elected to let the construction contractor make the decision whether metric or inch-pound recessed lighting fixtures should be used. Construction documents for bids or proposals, issued after 10 January 1997, will incorporate this policy. If the general contractor decides to use inch-pound recessed lighting fixtures, he will be allowed to use substitute inch-pound products for all suspended ceiling components provided they do not interfere with other design requirements.

e. Raised Access Flooring. Raised access flooring is a specialty item used primarily in computer rooms and other areas where provision for under floor cabling is desirable. A number of manufacturers make raised access flooring to fit the 100 mm module, but there may be a cost premium for small orders and longer delivery times for most orders. Metric raised access flooring can be specified if costs are comparable to inch-pound access flooring and procurement lead times are acceptable.

f. Wallboard. Wallboard is formed in continuous sheets of variable widths and cut to specified lengths. A variety of manufacturers make wallboard to fit the 100 mm module, but there may also be a cost premium for small orders and longer delivery times for most orders. While the use of metric wallboard is desirable in metric projects, its use is not mandatory on small projects or small orders if project duration or cost will increase. Where framing spacing is specified to fit modular metric construction, the contractor should not be allowed to cut or trim the sealed edges of inch-pound (soft metric) wallboard sheets to fit into the metric frame spacing.

g. Plywood and Particleboard. Like wallboard, wood-based sheet products such as plywood and particleboard can be produced in modular metric sizes. There may be a premium for small orders and longer delivery times for most orders. When framing spacing is specified to fit modular metric construction, the construction contractor may make the decision whether metric sheets or trimmed inch-pound sheets offer the most efficient and cost-effective solution in each situation.

h. Rigid Insulation. Rigid insulation is used on exterior walls and as a roof underlay. Currently this product is available only in inch-pound sizes and must be cut to fit metric framing spacing. On roofs, the product is usually laid over a rigid substrate that allows any sheet size to be used. Where the sheets are applied directly to metric framing spacing (400 or 600 mm), the width must be trimmed by the contractor.

5. ADDITIONAL GUIDANCE AND INFORMATION ON METRICATION.

a. Further guidance on the Federal acquisition of modular metric construction products is available from the Construction Metrication Council of the National Institute of Building Sciences, 1201 L Street, N.W., Suite 400, Washington D.C. 20005, Tel. 202-289-7800. The Construction Metrication Council issues a bimonthly newsletter, *Metric in Construction* which provides private and public support for the metrication of Federal construction and promotes the adoption and use of the metric system of measurement.

b. If you have any questions regarding metrication you should first contact your district metric point of contact (POC). If you do not know who your metric POC is, contact your district Architectural POC. The list of Architectural POCs can be accessed from the CEMP-EA web site (URL http://www.hq.usace.army.mil/cemp/e/ea/garg/gindx.htm). Quite often the district metric POC and the Architectural POC are the same individual. The metric or Architectural POC will be able to assist you in obtaining the answer.

c. Two exportable (video) metric training courses have been developed and issued to each district's metric POC. The first course, consisting of three 20 minute (approximately) video tapes, provides an introduction to the metric system, a basic understanding of metric units, and the specific rules for the use of the metric system. This course is intended to benefit all USACE team members. The second course addresses some specifics of design using the metric system of measurement, and is intended for design and construction professionals. If you would like to receive the metric video training, contact your metric POC.

6. This CB was coordinated with the following HQUSACE organizations: The Principal Assistant Responsible for Contracting (CEPR-ZA); Engineering Division (CEMP-EA); Office of the Chief Counsel (CECC-C); and Operations, Construction, and Readiness Division (CECW-O).

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